

data/USD.csv

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1 Tables of Friedman, Aligned Friedman, Bonferroni-Dunn, Holm, Hochberg and Hommel Tests

1

Table 1: Average Rankings of the algorithms (Friedman)

Algorithm	Ranking
C45Rules $_G M_t st$	4.7142857142857135
OCEC $_G M_t st$	3.5476190476190466
Ripper $_G M_t st$	4.928571428571426
Gassist $_G M_t st$	5.666666666666669
REGAL $_G M_t st$	5.809523809523812
UCS $_G M_t st$	5.488095238095238
REGALTC $_G M_t st$	4.249999999999999
SIA $_G M_t st$	5.785714285714285
Oblique-DT $_G M_t st$	4.809523809523808

Friedman statistic (distributed according to chi-square with 8 degrees of freedom: 26.6015873015873. P-value computed by Friedman

Test: 8.281040089634928E-4.

Iman and Davenport statistic (distributed according to F-distribution with 8 and 328 degrees of freedom: 3.5251153031228033. P-value computed by Iman and Davenport Test: 6.276467542705636E-4.

Table 2: Average Rankings of the algorithms (Aligned Friedman)

Algorithm	Ranking
C45Rules $_G M_t st$	189.49999999999997
OCEC $_G M_t st$	128.07142857142856
Ripper $_G M_t st$	173.61904761904762
GAssist $_G M_t st$	222.2619047619047
REGAL $_G M_t st$	226.25000000000003
UCS $_G M_t st$	209.202380952381
REGALTC $_G M_t st$	168.32142857142853
SIA $_G M_t st$	214.70238095238093
Oblique-DT $_G M_t st$	173.57142857142856

Aligned Friedman statistic (distributed according to chi-square with 8 degrees of freedom: 38.575889538128585. P-value computed by

Aligned Friedman Test: 5.890795214513744E-6.

Table 3: Average Rankings of the algorithms (Quade)

Algorithm	Ranking
C45Rules _G M _t st	4.785160575858252
OCEC _G M _t st	3.3687707641196014
Ripper _G M _t st	4.904761904761906
GAssist _G M _t st	5.939091915836103
REGAL _G M _t st	6.21040974529347
UCS _G M _t st	5.28405315614618
REGALTC _G M _t st	4.624584717607974
SIA _G M _t st	5.357696566998892
Oblique-DT _G M _t st	4.52547065337763

Quade statistic (distributed according to F-distribution with 8 and 328 degrees of freedom: 3.1478499147039383. P-value computed by Quade Test: 0.0019010950578096464.

Table 4: Contrast Estimation

	C45Rules $M_{f, st}$	OCEC $M_{f, st}$	Ripper $M_{f, st}$	GAssist $M_{f, st}$	REGAL $M_{f, st}$	UCSG $M_{f, st}$	REGALTC $M_{f, st}$	SIA $M_{f, st}$	Oblique-DT $M_{f, st}$
C45Rules $M_{f, st}$	0.00000000	-0.01483444	0.00771556	0.02243833	0.02513056	0.02058000	-0.00343944	0.03223389	0.01032556
OCEC $M_{f, st}$	0.01483444	0.00000000	0.02255000	0.03727278	0.03996500	0.03541444	0.01139500	0.04706833	0.02516000
Ripper $M_{f, st}$	-0.00771556	-0.02255000	0.00000000	0.01472278	0.01741500	0.01286444	-0.01115500	0.02451833	0.00261000
GAssist $M_{f, st}$	-0.02243833	-0.03727278	-0.01472278	0.00000000	0.00269222	-0.00185833	-0.02587778	0.00979556	-0.01211278
REGAL $M_{f, st}$	-0.02513056	-0.03996500	-0.01741500	-0.00269222	0.00000000	-0.00455056	-0.02857000	0.00710333	-0.01480500
UCSG $M_{f, st}$	-0.02058000	-0.03541444	-0.01286444	0.00185833	0.00455056	0.00000000	-0.02401944	0.01165389	-0.01025544
REGALTC $M_{f, st}$	0.00343944	-0.01139500	0.01115500	0.02387778	0.02857000	0.02401944	0.00000000	0.03567333	0.01376500
SIA $M_{f, st}$	-0.03223389	-0.04706833	-0.02451833	-0.00979556	-0.00710333	-0.01165389	-0.03567333	0.00000000	-0.02190833
Oblique-DT $M_{f, st}$	-0.01032556	-0.02516000	-0.00261000	0.01211278	0.01480500	0.01025544	-0.01376500	0.02190833	0.00000000

Table 5: Holm / Hochberg / Holland / Rom / Finner / Li Table for $\alpha = 0.05$ (FRIEDMAN)

i	algorithm	$z = (R_0 - R_i) / SE$	p	Holm/Hochberg/Hommel	Holland	Rom	Finner	Li
8	REGAL _C M_t st	3.784890596225586	1.5377621201971602E-4	0.00625	0.006391150954545011	0.006574125233361166	0.006391150954545011	0.0400067651540
7	SIA _G M_t st	3.7450496425811	1.8035810940055416E-4	0.0071428571428571435	0.007300831979014655	0.0075128293213784685	0.012741455098566168	0.0400067651540
6	GAssist _G M_t st	3.5458448743587065	3.913565148752947E-4	0.008333333333333333	0.008512444610847103	0.008764162596519848	0.019051173490195694	0.0400067651540
5	UCS _G M_t st	3.2470377220251048	0.0011661293284755234	0.01	0.010206218313011495	0.010515350115740741	0.025320565519103666	0.0400067651540
4	Ripper _G M_t st	2.3107753113798255	0.02084526887470273	0.0125	0.012741455098566168	0.013109375000000001	0.031549888917161595	0.0400067651540
3	Oblique-DT _G M_t st	2.1115705431574288	0.03472330135247496	0.016666666666666666	0.016952427508441503	0.016666666666666666	0.03773939976903784	0.0400067651540
2	C45Rules _G M_t st	1.9522067285795102	0.05091366566364985	0.025	0.025320565519103666	0.025	0.04388935252272508	0.0400067651540
1	REGALTC _G M_t st	1.1753081325121542	0.23987146207323828	0.05	0.0500000000000000044	0.05	0.0500000000000000044	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value ≤ 0.00625 .

Holm's procedure rejects those hypotheses that have a p-value ≤ 0.0125 .

Hochberg's procedure rejects those hypotheses that have a p-value ≤ 0.01 .

Hommel's procedure rejects those hypotheses that have a p-value ≤ 0.0125 .

Holland's procedure rejects those hypotheses that have a p-value $\leq 0.012741455098566168$.

Rom's procedure rejects those hypotheses that have a p-value $\leq 0.010515350115740741$.

Finner's procedure rejects those hypotheses that have a p-value ≤ 0.04388935252272508 .

Li's procedure rejects those hypotheses that have a p-value ≤ 0.04000676515404009 .

Table 6: Holm / Hochberg / Holland / Rom / Finner / Li Table for $\alpha = 0.05$ (ALIGNED FRIEDMAN)

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel	Holland	Rom	Finner	Li
8	REGAL _C $M_{t,st}$	4.11766939053775	3.827232063095174E-5	0.00625	0.006391150954545011	0.006574125233361166	0.006391150954545011	0.04782156925804
7	GAssist _C $M_{t,st}$	3.9504062347441065	7.801865871098826E-5	0.0071428571428571435	0.007300831979014655	0.0075128293213784685	0.012741455098566168	0.04782156925804
6	SIA _G $M_{t,st}$	3.6333551782397464	2.797594979163258E-4	0.008333333333333333	0.008512444610847103	0.008764162596519848	0.0119051173490195694	0.04782156925804
5	UCS _C $M_{t,st}$	3.402681811145237	6.67279421323883E-4	0.01	0.010206218313011495	0.010515350115740741	0.025320565519103666	0.04782156925804
4	C45Rules _C $M_{t,st}$	2.5763518922244177	0.009984897172007142	0.0125	0.012741455098566168	0.013109375000000001	0.031549888917161595	0.04782156925804
3	Ripper _G $M_{t,st}$	1.9102950270640753	0.05609523771416128	0.016666666666666666	0.016952427508441503	0.016666666666666666	0.03773939976903784	0.04782156925804
2	Oblique-DT _C $M_{t,st}$	1.908297850545984	0.05635273008728707	0.025	0.025320565519103666	0.025	0.04388935252272508	0.04782156925804
1	REGALTC _C $M_{t,st}$	1.6881096410098357	0.0913901840970827	0.05	0.050000000000000044	0.05	0.050000000000000044	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value ≤ 0.00625 .

Holm's procedure rejects those hypotheses that have a p-value $\leq 0.016666666666666666$.

Hochberg's procedure rejects those hypotheses that have a p-value ≤ 0.0125 .

Hommel's procedure rejects those hypotheses that have a p-value $\leq 0.016666666666666666$.

Holland's procedure rejects those hypotheses that have a p-value $\leq 0.016952427508441503$.

Rom's procedure rejects those hypotheses that have a p-value $\leq 0.013109375000000001$.

Finner's procedure rejects those hypotheses that have a p-value ≤ 0.03773939976903784 .

Li's procedure rejects those hypotheses that have a p-value $\leq 0.047821569258048285$.

Table 7: Holm / Hochberg / Holland / Rom / Finner / Li Table for $\alpha = 0.05$ (QUADE)

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel	Holland	Rom	Finner	Li
8	REGAL- $C M_{t,st}$	2.0710391858269315	0.03835513422727821	0.00625	0.006391150954545011	0.006574125233361166	0.006391150954545011	0.0316202717338666
7	GAssist- $C M_{t,st}$	1.8732977203056527	0.06102728451224942	0.0071428571428571435	0.007300831979014655	0.0075128293213784685	0.012741455098566168	0.0316202717338666
6	SIA- $G M_{t,st}$	1.4495660084743427	0.14717958067125386	0.008333333333333333	0.008512444610847103	0.008764162596519848	0.019051173490195694	0.0316202717338666
5	UCS- $M_{t,st}$	1.3958933249757108	0.1627466210368894	0.01	0.010206218313011495	0.010515350115740741	0.025320565519103666	0.0316202717338666
4	Ripper- $G M_{t,st}$	1.1194588272571913	0.2629444464067154	0.0125	0.012741455098566168	0.013109375000000001	0.031549888917161595	0.0316202717338666
3	C45Rules- $G M_{t,st}$	1.0322911608233225	0.30193574063119144	0.016666666666666666	0.016952427508441503	0.016666666666666666	0.03773939976903784	0.0316202717338666
2	REGALTC- $M_{t,st}$	0.9152604975556271	0.36005489161384896	0.025	0.025320565519103666	0.025	0.04388935252272508	0.0316202717338666
1	Oblique-DTC- $M_{t,st}$	0.8430243295386697	0.3992148370565457	0.05	0.050000000000000044	0.05	0.050000000000000044	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value ≤ 0.00625 .

Holm's procedure rejects those hypotheses that have a p-value ≤ 0.00625 .

Hommel's procedure rejects those hypotheses that have a p-value ≤ 0.00625 .

Holland's procedure rejects those hypotheses that have a p-value $\leq 0.006391150954545011$.

Finner's procedure rejects those hypotheses that have a p-value $\leq 0.006391150954545011$.

Li's procedure rejects those hypotheses that have a p-value $\leq 0.031620271733866602$.

Table 8: Adjusted p -values (FRIEDMAN)

i	algorithm	unadjusted p	p_{Bonf}	p_{Holm}	p_{FDR}	p_{ocb}	p_{omm}
1	REGAL $_G M_t.st$	1.53776212019171602E-4	0.0012302096961577282	0.0012302096961577282	0.0012302096961577282	0.0010764334841380121	
2	SIA $_G M_t.st$	1.8035810940055416E-4	0.0014428648752044333	0.0012625067658038791	0.0012625067658038791	0.0012625067658038791	
3	GAssist $_G M_t.st$	3.913565148752947E-4	0.0031308521190023574	0.0023481390892517683	0.0023481390892517683	0.0023481390892517683	
4	UCS $_G M_t.st$	0.0011661293284755234	0.009329034627804187	0.0058306466423776165	0.0058306466423776165	0.0058306466423776165	
5	Ripper $_G M_t.st$	0.02084526887470273	0.16676215099762184	0.08338107549881092	0.08338107549881092	0.06788488755153313	
6	Oblique-DT $_G M_t.st$	0.03472330135247496	0.27778641081979966	0.10416990405742488	0.1018273313272997	0.07637049849547477	
7	C45Rules $_G M_t.st$	0.05091366566364985	0.4073093253091988	0.10416990405742488	0.1018273313272997	0.1018273313272997	
8	REGALTC $_G M_t.st$	0.23987146207323828	1.9189716965859063	0.23987146207323828	0.23987146207323828	0.23987146207323828	

Table 9: Adjusted p -values (FRIEDMAN)

i	algorithm	unadjusted p	p_{Hol}	p_{Rom}	p_{Finn}	p_{Li}
1	REGAL $_G M_t.st$	1.53776212019171602E-4	0.0012295477803003774	0.0011695564547459538	0.0012295477803003774	2.022619876327275E-4
2	SIA $_G M_t.st$	1.8035810940055416E-4	0.0012618238611072918	0.001200334133023148	0.0012295477803003774	2.372168869006313E-4
3	GAssist $_G M_t.st$	3.913565148752947E-4	0.002345842888876737	0.0022327091183286466	0.0012295477803003774	5.145907657847967E-4
4	UCS $_G M_t.st$	0.0011661293284755234	0.005817063914724585	0.005544890639113906	0.002330898799340231	0.0015317713083159669
5	Ripper $_G M_t.st$	0.02084526887470273	0.08080996646126015	0.07950519713831791	0.033143274115864596	0.026691380291070273
6	Oblique-DT $_G M_t.st$	0.03472330135247496	0.10059464723729095	0.1018273313272997	0.046027702159433415	0.043685250051080815
7	C45Rules $_G M_t.st$	0.05091366566364985	0.10059464723729095	0.1018273313272997	0.05797228503090135	0.06277560580480225
8	REGALTC $_G M_t.st$	0.23987146207323828	0.23987146207323828	0.23987146207323828	0.23987146207323828	0.23987146207323828

Table 10: Adjusted p -values (ALIGNED FRIEDMAN)

i	algorithm	unadjusted p	p_{Bonf}	p_{Holm}	p_{Hoch}	p_{Homn}
1	REGAL $_G M_t st$	3.827232063095174E-5	3.0617856504761395E-4	3.0617856504761395E-4	3.0617856504761395E-4	3.0617856504761395E-4
2	GAssist $_G M_t st$	7.801865871098826E-5	6.241492696879061E-4	5.461306109769179E-4	5.461306109769179E-4	5.461306109769179E-4
3	SIA $_G M_t st$	2.797594979163258E-4	0.0022380759833306066	0.0016785569874979548	0.0016785569874979548	0.0016785569874979548
4	UC $_G M_t st$	6.67279421323883E-4	0.005338235370591064	0.003336397106619415	0.003336397106619415	0.003336397106619415
5	C45Rules $_G M_t st$	0.009984897172007142	0.07987917737605714	0.03993958868802857	0.03993958868802857	0.03993958868802857
6	Ripper $_G M_t st$	0.05609523771416128	0.4487619017132902	0.16828571314248383	0.0913901840970827	0.0913901840970827
7	Oblique-DT $_G M_t st$	0.05635273008728707	0.45082184069829656	0.16828571314248383	0.0913901840970827	0.0913901840970827
8	REGALTC $_G M_t st$	0.0913901840970827	0.7311214727766616	0.16828571314248383	0.0913901840970827	0.0913901840970827

Table 11: Adjusted p -values (ALIGNED FRIEDMAN)

i	algorithm	unadjusted p	p_{Holl}	p_{Rom}	p_{Finn}	p_{Li}
1	REGAL $_G M_t st$	3.827232063095174E-5	3.0613755461184056E-4	2.910829903021499E-4	3.0613755461184056E-4	4.212006950432924E-5
2	GAssist $_G M_t st$	7.801865871098826E-5	5.46002802463974E-4	5.192361983319572E-4	3.1203811527702463E-4	8.585859273512364E-5
3	SIA $_G M_t st$	2.797594979163258E-4	0.0016773834446658364	0.0015960423761844356	7.458514155305185E-4	3.0780361606958445E-4
4	UC $_G M_t st$	6.67279421323883E-4	0.00333319474585072895	0.003172882566815405	0.0013341135808215832	7.338570659650636E-4
5	C45Rules $_G M_t st$	0.009984897172007142	0.03934537162305385	0.0380304046534309	0.01592791641868785	0.010869752492460439
6	Ripper $_G M_t st$	0.05609523771416128	0.159022199580935	0.0913901840970827	0.0740854622547642	0.05814755246055466
7	Oblique-DT $_G M_t st$	0.05635273008728707	0.159022199580935	0.0913901840970827	0.0740854622547642	0.058398887809268312
8	REGALTC $_G M_t st$	0.0913901840970827	0.159022199580935	0.0913901840970827	0.0913901840970827	0.0913901840970827

Table 12: Adjusted p -values (QUADE)

i	algorithm	unadjusted p	p_{Bonf}	p_{Holm}	p_{Hoch}	p_{Hom}
1	REGAL $_G M_t st$	0.03835513422727821	0.3068410738182257	0.3068410738182257	0.3068410738182257	0.26848593959094746
2	GAssist $_G M_t st$	0.06102728451224942	0.48821827609799534	0.42719099158857459	0.3992148370565457	0.3797421157527419
3	SIA $_G M_t st$	0.14717958067125386	1.177436645370031	0.8830774840275232	0.3992148370565457	0.39921483705654576
4	UCS $_G M_t st$	0.1627466210368894	1.301972968295115	0.8830774840275232	0.3992148370565457	0.39921483705654576
5	Ripper $_G M_t st$	0.2629444464067154	2.103555571253723	1.0517777856268615	0.3992148370565457	0.39921483705654576
6	C45Rules $_G M_t st$	0.30193574063119144	2.4154859250495315	1.0517777856268615	0.3992148370565457	0.39921483705654576
7	REGALITC $_G M_t st$	0.36005489161384896	2.8804391329107917	1.0517777856268615	0.3992148370565457	0.39921483705654576
8	Oblique-DT $_G M_t st$	0.3992148370565457	3.1937186964523656	1.0517777856268615	0.3992148370565457	0.39921483705654576

Table 13: Adjusted p -values (QUADE)

i	algorithm	unadjusted p	p_{Holm}	p_{Finn}	p_{Li}
1	REGAL $_G M_t st$	0.03835513422727821	0.26866267661916754	0.2917128352882647	0.06001050848626504
2	GAssist $_G M_t st$	0.06102728451224942	0.35646701871558684	0.3992148370565457	0.09221235524787266
3	SIA $_G M_t st$	0.14717958067125386	0.6152793113258723	0.3992148370565457	0.19677342004113105
4	UCS $_G M_t st$	0.1627466210368894	0.6152793113258723	0.3992148370565457	0.2131497659317862
5	Ripper $_G M_t st$	0.2629444464067154	0.7048784715108525	0.3992148370565457	0.3044291217532101
6	C45Rules $_G M_t st$	0.30193574063119144	0.7048784715108525	0.3992148370565457	0.33447296881635186
7	REGALITC $_G M_t st$	0.36005489161384896	0.7048784715108525	0.3992148370565457	0.37472926935767725
8	Oblique-DT $_G M_t st$	0.3992148370565457	0.7048784715108525	0.3995887416282531	0.39921483705654576